

# EXHIBIT 1

1. Plaintiff 3M Co. is a corporation organized and existing under the laws of the state of Delaware, with its principal place of business at 3M Center, St. Paul, Minnesota.
2. Plaintiff 3M Innovative Properties is a corporation organized and existing under the laws of the state of Delaware, with its principal place of business at 3M Center, St. Paul, Minnesota.

3. On information and belief, Defendant Moldex is a corporation organized and existing under the laws of California, with its principal place of business at 10111 W. Jefferson Boulevard, Culver City, California, 90232.

### **JURISDICTION AND VENUE**

4. This is a claim for patent infringement pursuant to 35 U.S.C. § 271 et seq. This Court has subject matter jurisdiction over 3M's claims pursuant to 28 U.S.C. §§ 1331 and 1338.

5. Moldex is subject to personal jurisdiction in this District. On information and belief, Moldex does business throughout the United States, including in this judicial district. Under the Minnesota Long Arm Statute, Minn. Stat. § 543.19, Moldex transacts business in Minnesota and/or has committed acts of patent infringement within and/or outside Minnesota that have caused injury in Minnesota.

6. Venue is proper in this district pursuant to 28 U.S.C. §§ 1391 (b) and (c) and 1400(b).

### **3M'S PATENTS-IN-SUIT**

7. On May 2, 2006, the United States Patent and Trademark Office duly and legally issued United States Patent No. 7,036,157 ("the '157 patent"). The '157 patent is entitled "Method Of Producing A Hood, And A Hood Produced According To The Method." A true and correct copy of the '157 patent is attached hereto as Exhibit A.

8. On June 6, 2000, the United States Patent and Trademark Office duly and legally issued United States Patent No. 6,070,693 ("the '693 patent"). The '693 patent is

entitled "Hearing Protector Against Loud Noise." A true and correct copy of the '693 patent is attached hereto as Exhibit B.

9. 3M Innovative Properties owns all right, title and interest to the '157 patent.

10. 3M Co. is the exclusive licensee of the '157 patent.

11. 3M Innovative Properties is the exclusive licensee of the '693 patent. 3M Co. manufactures and sells, pursuant to an exclusive sub-license, personal hearing protection products embodying one or more inventions described and claimed in the '693 patent, including COMBAT ARMS® earplugs.

12. 3M conducts and has conducted considerable research, development, and testing of personal hearing protection products to better address the problem of hearing loss. Because of these efforts, 3M's personal hearing protection products are recognized worldwide for optimum comfort, protection, and ease of use.

#### **DEFENDANT'S INFRINGING ACTIVITIES**

13. On information and belief, Moldex makes, uses, and/or offers for sale products that infringe at least one claim of the '157 patent, including at least products known as the "M Series" earmuffs. A true and correct copy of promotional materials for the "M Series" earmuffs is attached hereto as Exhibit C.

14. On information and belief, Moldex makes, uses, and/or offers for sale products that infringe at least one claim of the '693 patent, including at least the product known as the "Battleplug" earplug. A true and correct copy of materials depicting the "Battleplug" earplug are attached hereto as Exhibit D.

15. Moldex maintains a website at www.moldex.com. The Moldex website provides contact information to obtain information about Moldex products. The Moldex website also includes an online product catalog, which includes product information and a distributor locator for all Moldex products.

### **THE HARM TO 3M**

16. Moldex has, by its infringing conduct, caused 3M irreparable harm for which there is no adequate remedy at law.

17. 3M has suffered damage as a result of Moldex's infringement to date.

18. This is an exceptional case under 35 U.S.C. § 285.

### **COUNT I: INFRINGEMENT OF THE '157 PATENT**

19. 3M incorporates the allegations contained in the above paragraphs as though fully set forth herein.

20. Moldex has been and now is directly infringing, actively inducing others to infringe and/or contributing to the infringement of the '157 patent by making, using, selling and/or offering for sale products, including at least the "M Series" earmuffs, in violation of 35 U.S.C. § 271.

21. Moldex will continue to directly infringe, actively induce others to infringe and/or contribute to the infringement of the '157 patent unless and until Moldex is enjoined by this Court.

22. On information and belief, Moldex has been and now is contributing to and inducing infringement of the '157 patent by offering to sell and selling products intended to practice one or more claims of the '157 patent, including at least products known as

the "M Series" earmuffs. On information and belief, the infringing products are intended to be made or adapted for use in practicing one or more claims of the '157 patent, and the infringing products are not staple articles or commodities of commerce suitable for substantial non-infringing use. On information and belief, Moldex is and has been aware, through actual knowledge or willful blindness, that the infringing products would be used to practice one or more claims of the '157 patent.

23. Moldex's acts of infringement have caused and will continue to cause damage to 3M, and 3M is entitled to recover from Moldex the damages sustained by 3M and any additional remedy in an amount to be determined at trial.

24. Moldex's acts of infringement will continue to cause 3M irreparable harm in the future unless and until Moldex is enjoined from infringing the '157 patent.

25. 3M marked its products with the patent number of the '157 patent.

**COUNT II: INFRINGEMENT OF THE '693 PATENT**

26. 3M incorporates the allegations contained in the above paragraphs as though fully set forth herein.

27. Moldex has been and now is directly infringing, actively inducing others to infringe and/or contributing to the infringement of the '693 patent by making, using, selling and/or offering for sale infringing products, including at least the "Battleplug," earplug in violation of 35 U.S.C. § 271.

28. On information and belief, Moldex has been and now is contributing to and inducing infringement of the '693 patent by offering to sell and selling infringing products intended to practice one or more claims of the '693 patent, including at least the

product known as the "Battleplug" earplug. On information and belief, the infringing products are intended to be made or adapted for use in practicing one or more claims of the '693 patent, and the infringing products are not staple articles or commodities of commerce suitable for substantial non-infringing use. On information and belief, Moldex is and has been aware, through actual knowledge or willful blindness, that the infringing products would be used to practice one or more claims of the '693 patent.

29. On information and belief, Moldex will continue to directly infringe, actively induce others to infringe and/or contribute to the infringement of the '693 patent unless and until Moldex is enjoined by this Court.

30. Moldex's acts of infringement have caused and will continue to cause damage to 3M, and 3M is entitled to recover from Moldex the damages sustained by 3M and any additional remedy in an amount to be determined at trial.

31. Moldex's acts of infringement will continue to cause 3M irreparable harm in the future unless and until Moldex is enjoined from infringing the '693 patent.

#### **PRAYER FOR RELIEF**

**WHEREFORE**, 3M respectfully requests that this Court enter judgment in its favor and against Moldex, as follows:

1. To enter judgment that Moldex has infringed one or more claims of the '157 and '693 patents in violation of 35 U.S.C. § 271;
2. To enter orders preliminarily and permanently enjoining Moldex and its officers, agents, servants, employees, and attorneys, and all of those in active concert or

participation with them who receive actual notice of the Order, from infringing the '157 and '693 patents;

3. To award 3M its damages in amounts adequate to compensate 3M for Moldex's infringement of the '157 and '693 patents consistent with 35 U.S.C. § 284, up to and including treble the amount of actual damages assessed, together with costs, and prejudgment and post-judgment interest;

4. To declare this case to be "exceptional" under 35 U.S.C. § 285 and to award 3M its attorneys' fees, expenses, and costs incurred in this action; and

5. To award 3M such other and further relief as this Court deems just and proper.

**JURY DEMAND**

Pursuant to Rule 38(b) of the Federal Rules of Civil Procedure, 3M requests a trial by jury on any and all issues on which a trial by jury is available under applicable law

Date: March 8, 2012

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PROPERTIES COMPANY**



(12) **United States Patent**  
**Andersson et al.**

(10) **Patent No.:** **US 7,036,157 B1**  
(45) **Date of Patent:** **May 2, 2006**

(54) **METHOD OF PRODUCING A HOOD, AND A HOOD PRODUCED ACCORDING TO THE METHOD**

(75) **Inventors:** **Magnus Andersson, Värnamo (SE);**  
**Jan Folkesson, Värnamo (SE)**

(73) **Assignee:** **Peltor AB, (SE)**

(\*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 574 days.

(21) **Appl. No.:** **10/030,505**

(22) **PCT Filed:** **Jun. 15, 2000**

(86) **PCT No.:** **PCT/SE00/01248**

§ 371 (c)(1),  
(2), (4) **Date:** **Jun. 3, 2002**

(87) **PCT Pub. No.:** **WO01/03623**

**PCT Pub. Date:** **Jan. 18, 2001**

(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**  
**A42B 1/06** (2006.01)

(52) **U.S. Cl.** ..... 2/209; 2/423; 181/129

(58) **Field of Classification Search** ..... 2/209,  
2/203, 423, 455; 128/864; 181/129; 379/433  
See application file for complete search history.

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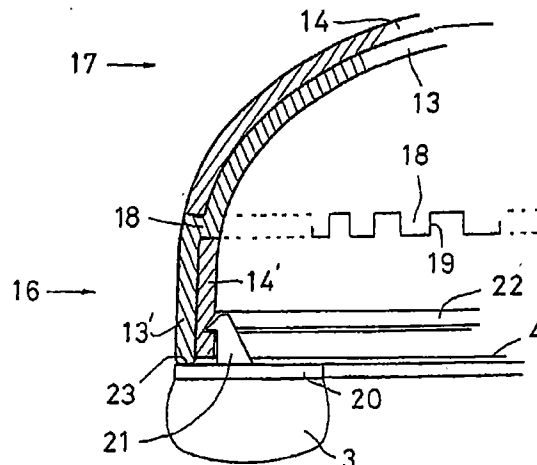
*Primary Examiner*—Tejash Patel

(74) *Attorney, Agent, or Firm*—Cantor Colburn LLP

(57) **ABSTRACT**

The disclosure relates to a method of producing a hood for a hearing protector by injection moulding of plastic material. The hood is injection moulded to a single contiguous piece employing at least two plastic materials possessing different properties in at least one respect. The plastic materials may be both homogeneous and in porous or foamed form. A hood for a hearing protector is produced from plastic by injection moulding. The hood includes at least two portions or layers which are united to one another. The portions or layers consist of plastic materials with different properties in at least one respect.

**113 Claims, 2 Drawing Sheets**



**Exhibit A**

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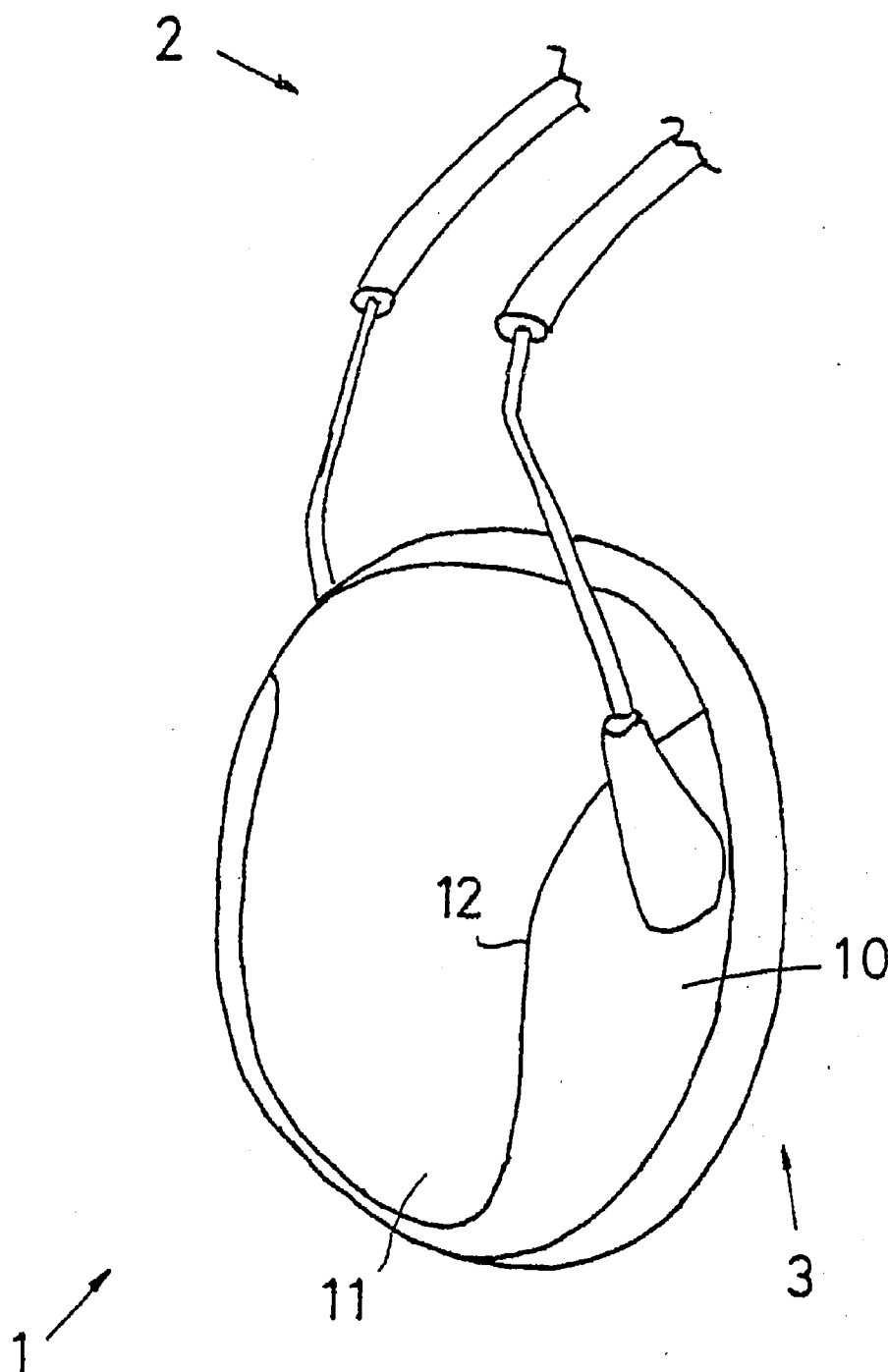


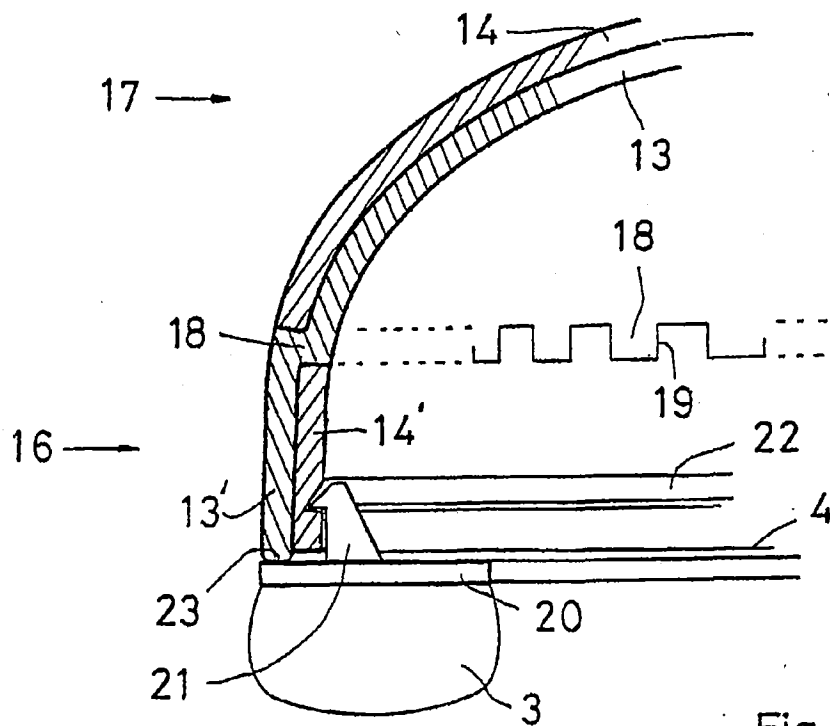
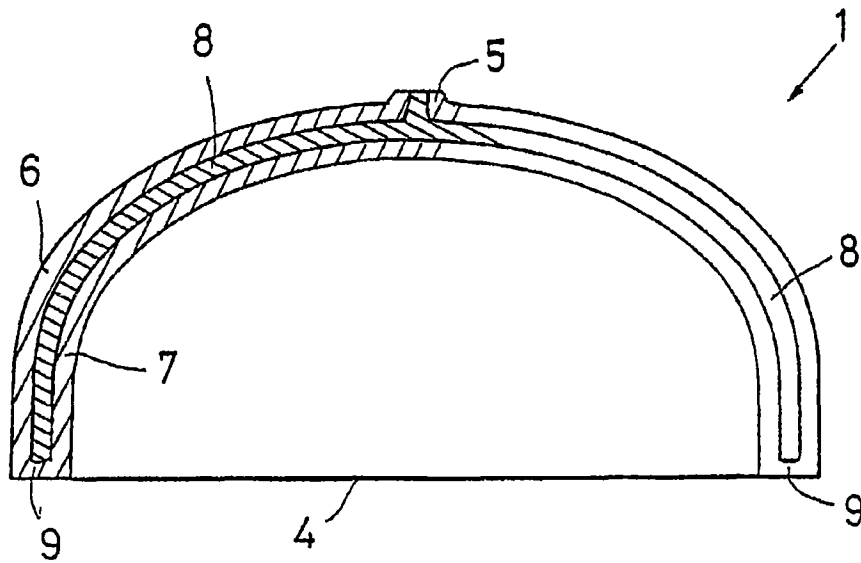
Fig 1

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# METHOD OF PRODUCING A HOOD, AND A HOOD PRODUCED ACCORDING TO THE METHOD

## FIELD OF THE INVENTION

The present invention relates to a method of producing a hood for a hearing protector, the hood being produced by injection moulding of plastic material.

The present invention also relates to a hood for a hearing protector in which the hood is produced from plastic by injection moulding.

## DESCRIPTION OF THE RELATED ART

A multiplicity of various acoustic hoods are previously known in the art for use in hearing protectors. Such hoods may be simple and consist of a cup-shaped shell injection moulded from plastic which is secured in one end of an arc which is placed over the head of the wearer and which has a similar hood at its opposite end. The hoods are dimensioned to enclose the wearer's ears.

A hood consisting exclusively of a shell is, despite quite complicated configuration, readily subjected to vibrations and oscillations, throughout the entirety of the hood or only locally in it, which implies that the sound-suppression or sound insulation which the hood achieves will be unpredictable and uneven within various frequency ranges.

In order to obviate the above-mentioned problem, various inlays of different sound-absorbing materials have been placed interiorly in the hood. Such solutions also suffer from similar drawbacks.

EP 484 306 discloses a hearing protector in which the hoods have a hard outer shell, inside this a casing of compressed foamed plastic, and inside this casing a further hard hood, which realises compression of the foamed layer lying outside. Interiorly in the inner hood, a sound-absorbent material is then placed.

Such a construction functions considerably better than the above-described construction consisting merely of a shell which is provided interiorly with a sound-absorbent. However, the construction is not optimal, either as regards rational production or sound-suppression/sound-insulation.

Similar constructions are also known from USPS 2 684 067, DE 3 441 120, DE 3 441 122, and others.

For a hood to be as favourable as possible in a hearing protector, the material in the hood should be "as dead as possible" so that it has a very slight ability to be excited into oscillation movements both as an entity and also locally.

## SUMMARY OF THE INVENTION

The present invention provides a method of manufacturing a hood which obviates the drawbacks inherent in hoods according to prior art technology, and in particular improves the sound-suppression capability of the hood. The present invention further provides extremely rational production of hoods, at the same time as these can be given an extremely aesthetically attractive appearance.

The present invention also obviates the drawbacks inherent in prior art designs and constructions, and in particular improves the sound-suppression capability of the hood. Finally, the present invention provides a hood such that it may be manufactured economically and rationally in large series and that it may be given an aesthetically attractive exterior.

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More specifically, the invention provides a hood that is injection moulded to one single continuous piece using plastic materials with different properties in at least one respect.

As regards the hood, the objects of the present invention will be attained if the hood is characterised in that it includes at least two mutually contiguous portions or layers which consist of plastic material with different properties in at least one respect.

By injection moulding of a hood where different portions are included in the hood, and where the injection moulded plastic material or materials have different properties in at least one respect, a hood will be realised which suffers from considerably less of a risk of being subjected to resonance oscillations both locally and for the hood as an entity. The hood will have improved sound-suppression capability.

Further, the possibility is afforded of extremely rational manufacture.

## BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described in greater detail hereinbelow, with particular reference to the accompanying Drawings. In the accompanying Drawings:

FIG. 1 is a perspective view of a part of a hearing protector employing a hood according to the present invention;

FIG. 2 is a cross section through a first embodiment of a hood according to the present invention; and

FIG. 3 is a partial cross sectional, on a larger scale, of a second embodiment of a hood according to the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

The basic concept behind the present invention is that there should be included, in one and the same hearing protector hood, at least two portions where the material in each portion differs in one way or another as regards oscillation from the material in the other portion or in the remaining portions. Differences which will be topical for consideration here are differences in density, differences in hardness, differences in modulus of elasticity, differences in structure, for example differences between homogeneous and porous plastic materials, differences between plastic materials with open or closed foamed structure, differences between plastic materials with and without different types of fillers, etc. As examples of usable plastics, mention might be made of ABS plastic, polypropylene, polyethylene and polycarbon plastics, TPE, etc.

The concept which lies behind the present invention takes as its point of departure the fact that a sound wave, i.e. a mechanical oscillation movement, which propagates in a body will at least partly be reflected and refracted when it impinges on an interface between materials with different properties. The reflected and refracted parts of the sound wave will interfere with each other and with the original sound wave, with a diffusion and attenuation of the sound wave as a result. This phenomenon becomes more manifest the higher the frequency the sound wave has.

If one considers a body, e.g. a hood included in a hearing protector, its oscillation properties are determined by material properties, configuration and dimensions. Different materials oscillate at different frequencies if the remaining properties remain constant. If two bodies which oscillate at different frequencies (e.g. depending upon different material

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properties in the bodies) are mechanically interconnected, the different oscillations will inhibit one another, whereby resonances are obstructed or reduced.

In FIG. 1, reference numeral 1 relates to a hood included in a hearing protector, the hood being pivotally secured in a stirrup 2 which is intended to extend over the head of the wearer of the hearing protector. On the side of the hood 1 facing towards the wearer's head, there is provided an abutment ring 3 which is produced from soft, resilient and yieldable material so that it may form itself according to the head of the person wearing the hearing protector, and thereby realise a seal between the interior of the hood, round the ear of the wearer and the ambient surroundings.

When the word "hood" is employed below and in the appended claims, this refers exclusively to the hood proper without loosely inserted damping material or other equipment and also without the above-mentioned abutment ring.

In the embodiment according to FIG. 2, the hood 1 is produced by injection moulding in accordance with the sandwich method. The hood 1 has a peripheral edge 4 facing towards the wearer's head and along which the above-mentioned abutment ring 3 is secured.

On its outside, the hood 1 has a sprue 5 via which molten plastic material is injected in under high pressure into the mould in which the hood 1 is produced. According to the sandwich method, a first plastic material which is to form the outer casing 6 of the hood and its inner casing 7 is injected in first. When injection of this first plastic material is completed, the injection continues with a second plastic material which is injected interiorly in the material which formed the outer casing and the inner casing. The first and second plastic materials have different material properties in at least one respect, such as density, hardness, etc. The second plastic material forms an intermediate layer 8 between the outer casing 6 and the inner casing 7. It should be observed that the outer casing 6 and the inner casing 7 have a connecting bridge 9 along the peripheral edge 4 of the hood 1. As a result, the material in the intermediate layer 8 will in principle be totally enclosed between the outer casing and the inner casing, possibly apart from the region at the sprue 5.

On injection moulding according to the sandwich method, the plastic material for the outer casing and the inner casing is fed to the moulding tool via a first feeder screw included in the injection moulding machine. A second feeder screw is employed for injecting the second material for the intermediate layer 8, in which event the tool may either have two separate inlets, one for each screw, or the tool may also be switched from a position for injection via the first screw to a position for injection via the second screw.

In the embodiment according to FIG. 1, the hood 1 has an outer, peripheral portion 10 which extends along the periphery of the hood apart from in its upper region. The bottom of the hood, i.e. substantially its central region, and its upper region are formed from a central portion 11 which is discrete from the outer portion 10 via a separation line 12 which, in practice, is only visual since the material in the outer portion 10 and the central portion 11 in principle form a single, contiguous piece where the different portions have materials with different properties.

In one variation of the embodiment according to FIG. 1, the outer portion 10 has a through-going material thickness such that the hood 1 has the same material externally and internally within the region which is defined by the outer portion 10. The corresponding feature naturally applies to the central portion 11. In another variation of the embodiment according to FIG. 1, the material within the outer

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portion 10 is double, with an outer layer which has a free surface on the outside of the hood, and an inner layer whose material differs from the material in the outer layer. The corresponding applies to the central portion 11, but however the materials in the outer and inner layers have been reversed, so that the material in the outer layer of the outer portion lies on the inside of the central portion 11, while the material in the outer layer within the central portion 11 lies on the inside of the outer layer in the outer portion 10. In the region of the separation line 12, the layers have mutually corresponding apertures and bridges, which will be illustrated more clearly with reference to FIG. 3.

FIG. 3 shows a duplex layer construction where the division between the layers may have any optionally formed separation lines which can define considerably more different regions than applies in FIG. 1, where only two different regions are shown.

In the embodiment according to FIG. 3, the shell 1 has, in its upper region in the Figure, a soft inner layer 13 and a hard outer layer 14. The two layers 13 and 14 are united to one another in a union interface where the materials have been caused to adhere powerfully to one another, possibly by fusion, during the injection moulding cycle proper. In the lower region of the embodiment according to FIG. 3, the soft material is outermost and forms an external band 13' along the peripheral edge 4 of the hood 1. On the inside of this external band 13', the hard material is located and there forms an inner band 14'.

The transition region between the edge area 16 of the hood 1 and its cupola area 17 includes alternatingly disposed bridges 18 and complementary apertures 19 accommodating the bridges 19.

As will be apparent from FIG. 1; an abutment ring 3 extends along the peripheral edge 4 of the hood 1. This has a carrier ring 20 with catches 21 or a circumferential ring for snapping into a groove 22 in the inside of the inner, hard band 14'. For the satisfactory function of the hearing protector, it is of vital importance that a good seal is obtained, on the one hand, between the interior of the hood 1 and the abutment ring 3 and, on the other hand, between the abutment ring 3 and the head of the wearer of the hearing protector. In the embodiment illustrated in FIG. 3, the outer, soft band 13' has been given the form of a seal 23 which abuts elastically compressed against the upper side of the carrier ring 20.

The division between the portions 10 and 11 of the hood 1 shown in FIG. 1 has been made merely for purposes of exemplification. Aesthetic considerations may be made in this design, without appreciably affecting the acoustic properties of the hood. On the other hand, it might possibly be expected that a division into more than two different contiguous portions may have a favourable effect on the acoustic properties of the hood.

What is claimed is:

1. A method of producing a hood for a hearing protector, comprising: injection molding of plastic material into a single contiguous piece employing plastic materials with different properties in at least one respect wherein said single contiguous piece includes at least two contiguous portions, the hood having an outer surface and an inner surface, said at least two contiguous portions being visible on said outer surface, and wherein one of said at least two contiguous portions comprises a central portion and another of said at least two contiguous portions at least partially surrounds said central portion.



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2. The method as claimed in claim 1, wherein the plastic materials are employed in both homogeneous and in porous or foamed form.

3. The method as claimed in claim 1, wherein at least two different plastic materials are employed.

4. The method as claimed in claim 3, wherein plastic materials of different densities are employed.

5. The method as claimed in claim 3, wherein plastic materials of different hardnesses are employed.

6. The method as claimed in claim 3, wherein plastic materials with different modulus of elasticity are employed.

7. A hood for a hearing protector produced from plastic by injection molding, comprising:

at least two mutually contiguous portions which comprise plastic materials with different properties in at least one respect wherein the hood has an outer surface and an inner surface, said at least two contiguous portions being visible on said outer surface, a separation line separating said at least two contiguous portions, and wherein one of said at least two contiguous portions comprises a central portion and another of said at least two contiguous portions at least partially surrounds said central portion.

8. The hood as claimed in claim 7, wherein at least one portion comprises a different plastic material than another portion.

9. The hood as claimed in claim 7, wherein a portion is disposed along a peripheral edge of the hood, is produced from a soft and elastic material, and is designed for sealing against an abutment ring which is disposed along the peripheral edge of the hood and designed to abut against a head of a wearer of the hearing protector in which the hood is included.

10. The method as claimed in claim 1 wherein one of said at least two contiguous portions comprises a softer plastic than the other of said contiguous portions.

11. The method as claimed in claim 1 including an abutment ring attached to said hood.

12. The hood as claimed in claim 7 wherein one of said at least two contiguous portions comprises a softer plastic than the other of said contiguous portions.

13. The hood as claimed in claim 7 including an abutment ring attached to said hood.

14. A hood for a hearing protector comprising:

at least two mutually contiguous portions which comprise plastic materials with different properties in at least one respect; and

wherein the hood has an outer surface and an inner surface, said at least two contiguous portions being visible on said outer surface, a separation line separating said at least two contiguous portions, and wherein one of said at least two contiguous portions comprises a central portion and another of said at least two contiguous portions at least partially surrounding said central portion.

15. The hood as claimed in claim 14, wherein at least one portion comprises a different plastic material than another portion.

16. The hood as claimed in claim 14, wherein a portion is disposed along a peripheral edge of the hood, is produced from a soft and elastic material, and is designed for sealing against an abutment ring which is disposed along the peripheral edge of the hood and designed to abut against a head of a wearer of the hearing protector in which the hood is included.

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17. The hood as claimed in claim 14 wherein one of said at least two contiguous portions comprises a softer plastic than the other of said contiguous portions.

18. The hood as claimed in claim 14 including an abutment ring attached to said hood.

19. A method of producing a hood for a hearing protector, the hood having an outer surface and an inner surface, comprising:

injection molding a first plastic material to form a first portion;

injection molding a second plastic material to form a second portion, said first and second portions being mutually contiguous to each other to define a single contiguous hood, said first and second portions being separated by a separation line which is visible on said outer surface of said hood, said first portion comprising a central portion and said second portion at least partially surrounding said central portion, said first plastic material having different properties in at least one respect from said second plastic material and wherein one of said first or second plastic materials is softer relative to the other of said first or second plastic materials.

20. A hood for a hearing protector produced from plastic injection molding comprising:

a first portion formed from injection molding a first plastic material;

a second portion formed from injection molding a second plastic material;

said first and second portions being mutually contiguous to each other to define a single contiguous hood, said first and second portions being separated by a separation line which is visible on said outer surface of said hood, said first portion comprising a central portion and said second portion at least partially surrounding said central portion, said first plastic material having different properties in at least one respect from said second plastic material and wherein one of said first or second plastic materials is softer relative to the other of said first or second plastic materials.

21. A hood for a hearing protector comprising:

a first portion formed from a first plastic material;

a second portion formed from a second plastic material;

said first and second portions being mutually contiguous to each other to define a single contiguous hood, said first and second portions being separated by a separation line which is visible on said outer surface of said hood, said first portion comprising a central portion and said second portion at least partially surrounding said central portion, said first plastic material having different properties in at least one respect from said second plastic material and wherein one of said first or second plastic materials is softer relative to the other of said first or second plastic materials.

22. A method of producing a hearing protector comprising a hood and an abutment ring, the abutment ring being disposed along a peripheral edge of the hood, the abutment ring intended to abut against the head of a wearer of the hearing protector in which the hood is included, wherein the hood is produced by a method, comprising:

injection molding of plastic material into a single contiguous piece employing plastic materials with different properties in at least one respect.

23. The method as claimed in claim 22, wherein the plastic materials are employed in both homogeneous and in porous or foamed form.

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24. The method as claimed in claim 22, wherein at least two different plastic materials are employed.

25. The method as claimed in claim 24, wherein plastic materials of different densities are employed.

26. The method as claimed in claim 24, wherein plastic materials of different hardnesses are employed.

27. The method as claimed in claim 24, wherein plastic materials with different modulus of elasticity are employed.

28. The method as claimed in claim 22 wherein the single contiguous piece includes at least two contiguous portions.

29. The method as claimed in claim 28 wherein the hood has an outer surface and an inner surface and wherein said at least two contiguous portions are visible on said outer surface.

30. The method as claimed in claim 29 wherein a separation line separates said at least two contiguous portions visible on said outer surface.

31. The method as claimed in claim 30 wherein one of said at least two contiguous portions comprise a central portion and another of said at least two contiguous portions at least partially surrounds said central portion.

32. The method as claimed in claim 30 including two of said contiguous portions wherein one of said portions comprises a softer plastic than the other of said contiguous portions.

33. A hearing protector comprising a hood and an abutment ring, the abutment ring being disposed along a peripheral edge of the hood, the abutment ring intended to abut against the head of a wearer of the hearing protector in which the hood is included, wherein the hood is produced from plastic by injection molding, comprising:

at least two mutually contiguous portions which comprise first and second plastic made of different materials and with different properties in at least one respect.

34. The hearing protector as claimed in claim 33, wherein the portions include an outer and an inner layer of a first plastic material with a first group of properties and an intermediate layer located therebetween and comprising a second plastic material with a second group of properties.

35. The hearing protector as claimed in claim 34, wherein the outer and inner layers have a hardness greater than the intermediate layer.

36. The hearing protector as claimed in claim 35, wherein the intermediate layer has a hardness greater than the outer and inner layers.

37. The hearing protector as claimed in claim 33, wherein the portions include two material layers, of which at least one has surfaces which are free towards both an outside and an inside of the hood.

38. The hearing protector as claimed in claim 33, wherein the portions include two material layers which both have surfaces which are free towards an outside of the hood and surfaces which are free towards the inside of the hood.

39. The hearing protector as claimed in claim 33, wherein at least one portion comprises a different plastic material than another portion.

40. The hearing protector as claimed in claim 33 wherein a contiguous portion disposed along said peripheral edge of the hood is produced from a soft and elastic material and is designed for sealing against said abutment ring.

41. The hearing protector as claimed in claim 35, wherein the intermediate layer has a foam structure.

42. The hearing protector as claimed in claim 36, wherein the outer and inner layers have a foam structure.

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43. The hearing protector as claimed in claim 33 wherein the hood has an outer surface and an inner surface and wherein said at least two contiguous portions are visible on said outer surface.

44. The hearing protector as claimed in claim 43 wherein a separation line separates said at least two contiguous portions visible on said outer surface.

45. The hearing protector as claimed in claim 44 wherein one of said at least two portions comprise a central portion and another of said at least two portions at least partially surrounds said central portion.

46. The hearing protector as claimed in claim 44 including two of said contiguous portions wherein one of said portions comprises a softer plastic than the other of said contiguous portions.

47. A hearing protector comprising a hood and an abutment ring, the abutment ring being disposed along a peripheral edge of the hood, the abutment ring intended to abut against the head of a wearer of the hearing protector in which the hood is included, wherein the hood comprises:

at least two mutually contiguous portions which comprise first and second plastic made of different materials and with different properties in at least one respect.

48. The hearing protector as claimed in claim 47, wherein the portions include an outer and an inner layer of a first plastic material with a first group of properties and an intermediate layer located therebetween and comprising a second plastic material with a second group of properties.

49. The hearing protector as claimed in claim 48, wherein the outer and inner layers have a hardness greater than the intermediate layer.

50. The hearing protector as claimed in claim 48, wherein the intermediate layer has a hardness greater than the outer and inner layers.

51. The hearing protector as claimed in claim 47, wherein the portions include two material layers, of which at least one has surfaces which are free towards both an outside and an inside of the hood.

52. The hearing protector as claimed in claim 47, wherein the portions include two material layers which both have surfaces which are free towards an outside of the hood and surfaces which are free towards the inside of the hood.

53. The hearing protector as claimed in claim 47, wherein at least one portion comprises a different plastic material than another portion.

54. The hearing protector as claimed in claim 47, wherein a contiguous portion disposed along said peripheral edge of the hood is produced from a soft and elastic material and is designed for sealing against said abutment.

55. The hearing protector as claimed in claim 49, wherein the intermediate layer has a foam structure.

56. The hearing protector as claimed in claim 50, wherein the outer and inner layers have a foam structure.

57. The hearing protector as claimed in claim 47 wherein the hood has an outer surface and an inner surface and wherein said at least two contiguous portions are visible on said outer surface.

58. The hearing protector as claimed in claim 57 wherein a separation line separates said at least two contiguous portions visible on said outer surface.

59. The hearing protector as claimed in claim 58 wherein one of said portions comprise a central portion and another of said portions at least partially surrounds said central portion.



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60. The hearing protector as claimed in claim 58 including two of said contiguous portions wherein one of said portions comprises a softer plastic than the other of said contiguous portions.

61. A method of producing a hood intended for use with a hearing protector where the hearing protector comprises a hood and an abutment ring, the abutment ring intended to be disposed along a peripheral edge of the hood, wherein the hood is produced by a method consisting essentially of injection molding of plastic material into a single contiguous piece employing plastic materials with different properties in at least one respect.

62. The method as claimed in claim 61, wherein the plastic materials are employed in both homogeneous and in porous or foamed form.

63. The method as claimed in claim 61, wherein at least two different plastic materials are employed.

64. The method as claimed in claim 63, wherein plastic materials of different densities are employed.

65. The method as claimed in claim 63, wherein plastic materials of different hardnesses are employed.

66. The method as claimed in claim 63, wherein plastic materials with different modulus of elasticity are employed.

67. The method as claimed in claim 61 wherein the single contiguous piece includes at least two contiguous portions.

68. The method as claimed in claim 67 wherein the hood has an outer surface and an inner surface and wherein said at least two contiguous portions are visible on said outer surface.

69. The method as claimed in claim 68 wherein a separation line separates said at least two contiguous portions visible on said outer surface.

70. The method as claimed in claim 69 wherein one of said at least two contiguous portions comprise a central portion and another of said at least two contiguous portions at least partially surrounds said central portion.

71. The method as claimed in claim 69 including two of said contiguous portions wherein one of said portions comprises a softer plastic than the other of said contiguous portions.

72. A hood intended for use with a hearing protector, the hearing protector comprising a hood and an abutment ring, the abutment ring intended to be disposed along a peripheral edge of the hood, wherein the hood is produced from plastic by injection molding, consisting essentially of:

at least two mutually contiguous portions which comprise plastic materials with different properties in at least one respect.

73. The hood as claimed in claim 72, wherein the portions include an outer and an inner layer of a first plastic material with a first group of properties and an intermediate layer located therebetween and comprising a second plastic material with a second group of properties.

74. The hood as claimed in claim 73, wherein the outer and inner layers have a hardness greater than the intermediate layer.

75. The hood as claimed in claim 74, wherein the intermediate layer has a hardness greater than the outer and inner layers.

76. The hood as claimed in claim 72, wherein the portions include two material layers, of which at least one has surfaces which are free towards both an outside and an inside of the hood.

77. The hood as claimed in claim 72, wherein the portions include two material layers which both have surfaces which are free towards an outside of the hood and surfaces which are free towards the inside of the hood.

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78. The hood as claimed in claim 72, wherein at least one portion comprises a different plastic material than another portion.

79. The hood as claimed in claim 72 wherein a contiguous portion disposed along said peripheral edge of the hood is produced from a soft and elastic material and is designed for sealing against said abutment ring.

80. The hood as claimed in claim 74, wherein the intermediate layer has a foam structure.

81. The hood as claimed in claim 75, wherein the outer and inner layers have a foam structure.

82. The hood as claimed in claim 72 wherein the hood has an outer surface and an inner surface and wherein said at least two contiguous portions are visible on said outer surface.

83. The hood as claimed in claim 82 wherein a separation line separates said at least two contiguous portions visible on said outer surface.

84. The hood as claimed in claim 83 wherein one of said at least two portions comprise a central portion and another of said at least two portions at least partially surrounds said central portion.

85. The hood as claimed in claim 83 including two of said contiguous portions wherein one of said portions comprises a softer plastic than the other of said contiguous portions.

86. A hood intended for use with a hearing protector, the hearing protector comprising a hood and an abutment ring, the abutment ring intended to be disposed along a peripheral edge of the hood, wherein the hood consists essentially of: at least two mutually contiguous portions which comprise plastic materials with different properties in at least one respect.

87. The hood as claimed in claim 86, wherein the portions include an outer and an inner layer of a first plastic material with a first group of properties and an intermediate layer located therebetween and comprising a second plastic material with a second group of properties.

88. The hood as claimed in claim 87, wherein the outer and inner layers have a hardness greater than the intermediate layer.

89. The hood as claimed in claim 87, wherein the intermediate layer has a hardness greater than the outer and inner layers.

90. The hood as claimed in claim 86, wherein the portions include two material layers, of which at least one has surfaces which are free towards both an outside and an inside of the hood.

91. The hood as claimed in claim 86, wherein the portions include two material layers which both have surfaces which are free towards an outside of the hood and surfaces which are free towards the inside of the hood.

92. The hood as claimed in claim 86, wherein at least one portion comprises a different plastic material than another portion.

93. The hood as claimed in claim 86, wherein a contiguous portion disposed along said peripheral edge of the hood is produced from a soft and elastic material and is designed for sealing against said abutment.

94. The hood as claimed in claim 88, wherein the intermediate layer has a foam structure.

95. The hood as claimed in claim 89, wherein the outer and inner layers have a foam structure.

96. The hood as claimed in claim 86 wherein the hood has an outer surface and an inner surface and wherein said at least two contiguous portions are visible on said outer surface.

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97. The hood as claimed in claim 96 wherein a separation line separates said at least two contiguous portions visible on said outer surface.

98. The hood as claimed in claim 97 wherein one of said portions comprise a central portion and another of said portions at least partially surrounds said central portion. 5

99. The hood as claimed in claim 97 including two of said contiguous portions wherein one of said portions comprises a softer plastic than the other of said contiguous portions.

100. A method of producing a hood for a hearing protector, comprising: 10

injection molding the hood from plastic materials to form a single piece having at least two contiguous portions, the plastic materials adhering to one another during the inject molding process, the plastic materials having different properties in at least one respect so as to improve the sound suppression capability of the hood by sound wave interference at an interface between the at least two contiguous portions. 15

101. The method as claimed in claim 100 wherein the plastic materials are employed in both homogeneous and in porous or foamed form. 20

102. The method as claimed in claim 100 wherein at least two different plastic materials are employed.

103. The method as claimed in claim 102 wherein plastic materials of different densities are employed. 25

104. The method as claimed in claim 102 wherein plastic materials of different hardnesses are employed.

105. The method as claimed in claim 102 wherein plastic materials with different modulus of elasticity are employed. 30

106. A hood for a hearing protector, the hood being produced from plastic by injection molding, wherein the hood includes at least two mutually contiguous portions or layers which consist of plastic materials, the plastic materials adhering to one another during the injection molding

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cycle, with the plastic materials having different properties in at least one respect so as to improve the sound-suppression capability of the hood by sound wave interference at an interface between the contiguous portions or layers.

107. The hood as claimed in claim 106 wherein the portions include an outer and an inner layer of a plastic material with a first group of properties and an intermediate layer located therebetween, the intermediate layer comprising a plastic material with a second group of properties.

108. The hood as claimed in claim 107 wherein the outer and inner layers are relatively hard, while the intermediate layer is softer or has a foamed structure.

109. The hood as claimed in claim 107 wherein the intermediate layer is relatively hard while the outer and inner layers are softer or have a foamed structure.

110. The hood as claimed in claim 106 wherein the portions include two material layers, of which at least one has surfaces which are exposed to both the outside of the hood and to the inside of the hood.

111. The hood as claimed in claim 106 wherein the portions include two material layers which both have surfaces which are exposed to the outside of the hood and surfaces which are exposed to the inside of the hood.

112. The hood as claimed in claim 106 wherein at least one of the portions or layers comprised a different plastic material than the other portion or layers.

113. The hood as claimed in claim 106 wherein a portion is disposed along the peripheral edge of the hood, wherein such portion is produced from a soft and elastic material and is intended to seal against an abutment ring which is disposed along a peripheral edge of the hood, the abutment ring intended to abut against the head of the wearer of the hearing protector in which the hood is included.

\* \* \* \* \*



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**Hamery**

[11] **Patent Number:** 6,070,693  
[45] **Date of Patent:** Jun. 6, 2000

[54] **HEARING PROTECTOR AGAINST LOUD NOISE**

[56] **References Cited**

[75] **Inventor:** Pascal Hamery, Mulhouse, France

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*Primary Examiner*—Khanh Dang  
*Attorney, Agent, or Firm*—Oliff & Berridge, PLC

[22] **Filed:** Jun. 20, 1999

[57] **ABSTRACT**

**Related U.S. Application Data**

[62] **Division of application No.** 08/994,015, Dec. 18, 1997, Pat.  
No. 5,936,208.

The invention relates to a hearing protector for attenuating, selectively or not, noises that can have an intensity of up to 190 dB, designed to be inserted in sealing fashion into the auditory canal. The hearing protector includes a flexible cylindrical body that has a ferrule at each end. At least one of the two ferrules has a channel that runs from one end of the ferrule to the center of the cylindrical body and contains an acoustic filter. When the two ferrules each contain an acoustic filter, the filters may or may not be identical.

**Foreign Application Priority Data**

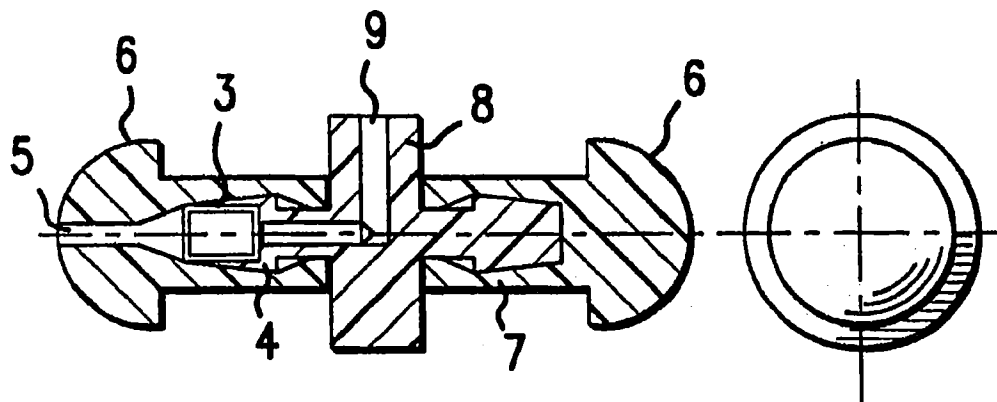
Sep. 18, 1997 [FR] France ..... 97.11623

[51] **Int. Cl.<sup>7</sup>** ..... A61B 7/02

[52] **U.S. Cl.** ..... 181/135

[58] **Field of Search** ..... 181/130, 135;  
128/864, 867; 2/209

17 Claims, 3 Drawing Sheets



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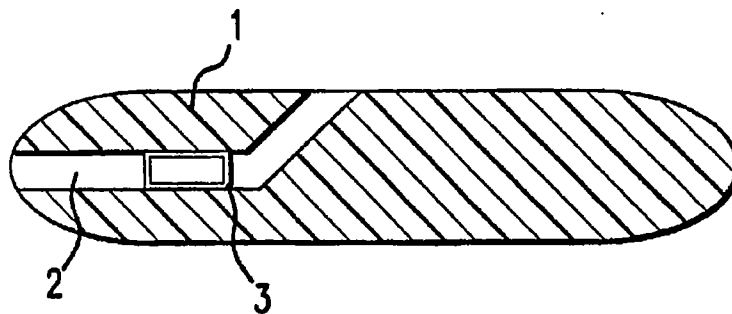


FIG. 1

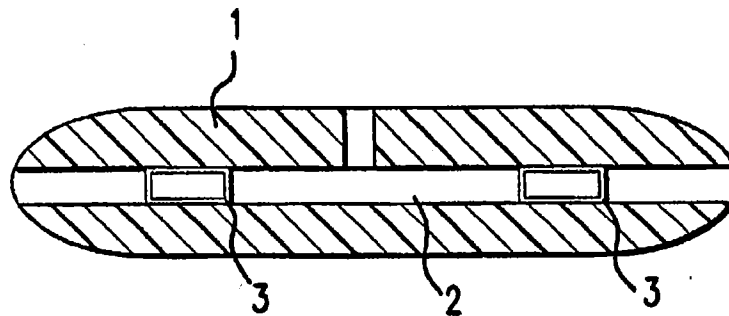


FIG. 2

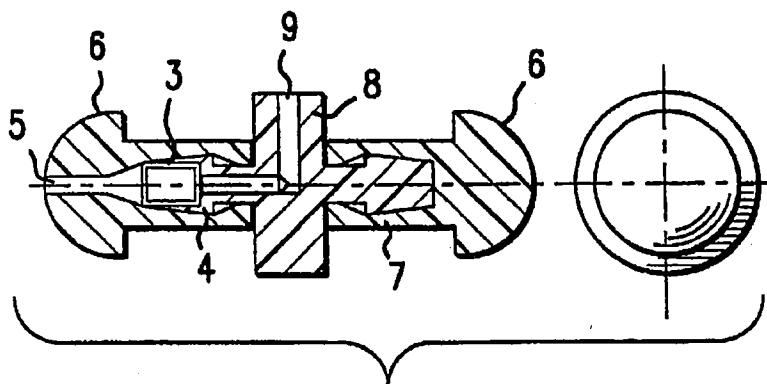


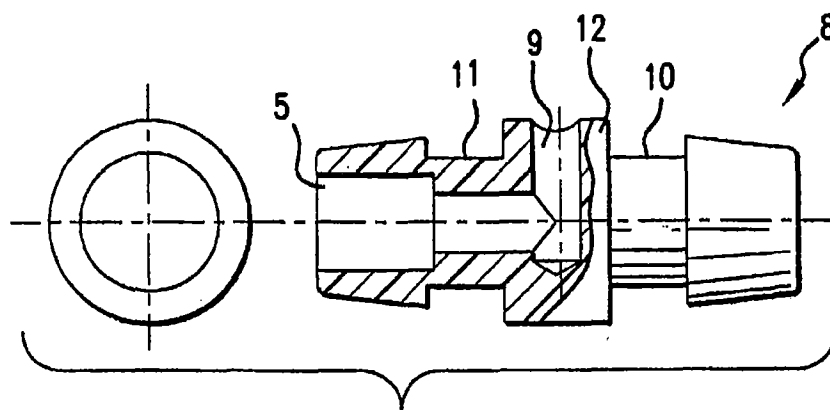
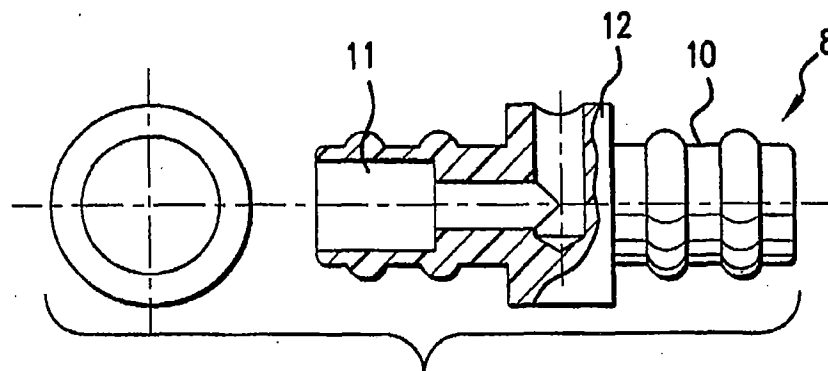
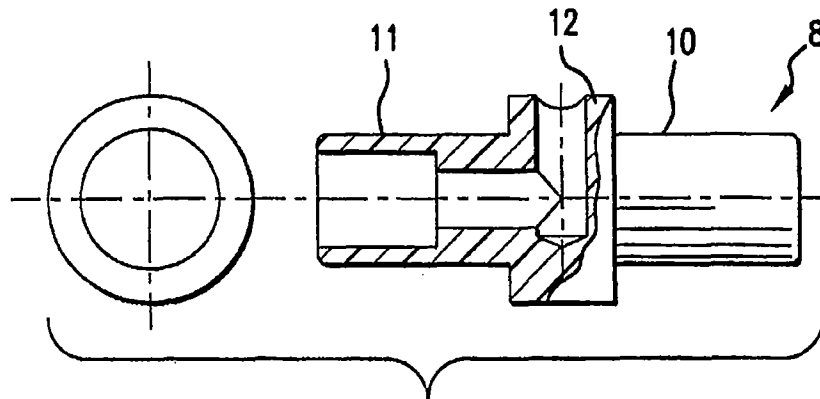
FIG. 3

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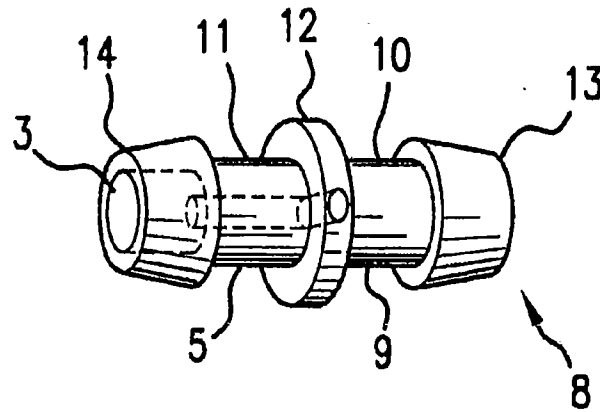


FIG. 5

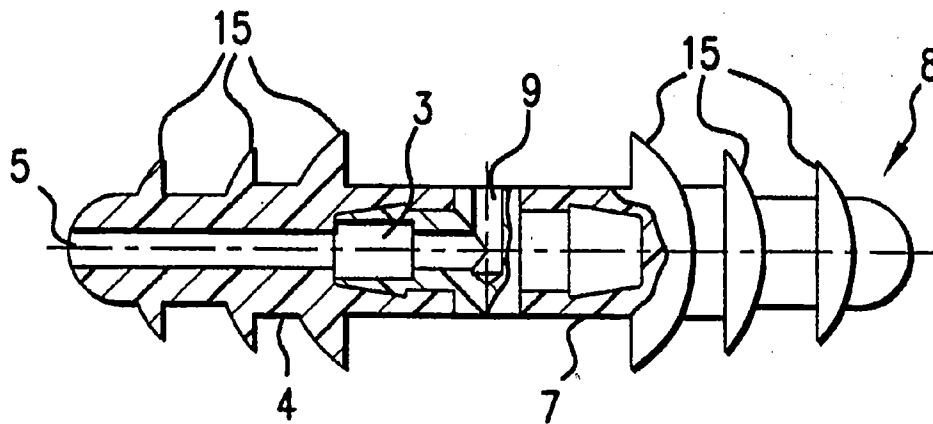


FIG. 6

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## HEARING PROTECTOR AGAINST LOUD NOISE

This is a Division of Application Ser. No. 08/994,015 filed Dec. 18, 1997, now U.S. Pat. No. 5,936,208. The entire disclosure of the prior application is hereby incorporated by reference herein in its entirety.

### BACKGROUND OF THE INVENTION

#### 1. Field of Invention

The invention relates to hearing protectors, and in particular, the invention relates to a hearing protector to protect against high, continuous or impulsive noises. The hearing protector can function either in a selective attenuation mode or a maximum attenuation mode.

#### 2. Description of Related Art

In the selective attenuation mode, sound attenuation is low for a specific range of frequencies and increases for sounds with frequencies above those in the specified range. Selective attenuation is especially effective for the loudest noises. A sample application of a hearing protector operating in the selective attenuation mode is the intelligible speech transmission in a noisy environment caused by impulsive noises, such as gunshots, for example. In this case, the frequency range in which the attenuation is low is between 100 Hz to 1000 Hz. In the maximum attenuation mode, the hearing protector stops all sounds throughout the frequency range, regardless of their intensity.

French Patent Publication No. 2 676 642, filed in the name of the Applicant, discloses a hearing protector that is not cumbersome and contacts the auditory canal. The protector comprises an elongate flexible body containing selective attenuation means, maximum attenuation means, and a manually controlled plug that makes it possible to choose the attenuation functional mode to be either selective or maximum. However, this device requires careful handling by the user who wants to block the auditory canal himself. This manipulation can be done incorrectly, resulting in inefficient blockage in the selective or maximum attenuation modes.

### SUMMARY OF THE INVENTION

The goal of the present invention is to provide a reliable hearing protector that does not suffer from the disadvantage of user adjustment and permits two configurations for noise attenuation that have different characteristics.

Another goal of the present invention is to provide a reliable hearing protector capable of selectively or automatically attenuating noises having intensities up to 190 dB. The hearing protector is intended to be sealably inserted into the auditory canal of the user. The hearing protector includes a flexible cylindrical body having a ferrule at each end, with at least one of the ferrules having a channel that runs from one end of the ferrule to the center of the body and contains an acoustic filter.

The hearing protector has two ends, both of which can be inserted into the auditory canal and is referred to as a "double-ended" device. This contrasts with the well-known hearing protector that typically has one end that can be inserted into the auditory canal, while the other end allows the hearing protector to be gripped so the user can position it in the auditory canal. The present invention has two ends, that may or may not be identical, either of which can be inserted into the auditory canal, thus making it possible to choose between two operating modes of attenuation that may or may not be identical.

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The device is useful in the fact that it possesses, in the same hearing protector, two configurations that can have different attenuation characteristics, both obtained by simply reversing the direction of the hearing protector, or ear plug, that is inserted into the auditory canal.

In a preferred embodiment, the two ferrules are separate parts linked by an internal connector. The internal connector may be a single cylinder pierced by a channel containing an acoustic filter, the cylinder forming a right angle that terminates at a first end of the channel and a second end at the center of the connector.

The internal connector may also be a single cylinder having a channel that terminates at three locations, such as at the center of the connector or at each end of the connector, with the parts of the channel terminating at the ends containing an acoustic filter that may or may not be identical.

The internal connector may also be composed of three cylindrical parts. The central part may have a channel at its center with a diameter slightly greater than that of the other two parts. The other two parts have a diameter that is essentially equal to or slightly larger than that of the channel. At least one of the two parts is pierced by a channel at its center which contains an acoustic filter and communicates with the channel in the central part. When the two parts each contain an acoustic filter, the filters may or may not be identical.

In an alternate embodiment, the internal connector may have serrations, or ridges, to hold the ferrules in place while in the auditory canal.

In yet another embodiment, the hearing protector may have tapered ends.

Preferably, each ferrule of the hearing protector is provided with an essentially hemispherical face of which the narrower side is intended to be inserted first into the auditory canal.

Advantageously, the body of the hearing protector may be provided with flexible annular fins having a diameter that increases from the inside to the outside of the auditory canal in order to wedgingly secure it in the auditory canal.

The hearing protector makes it possible to perform non-linear sound filtration by choosing the correct acoustic filter.

### BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in conjunction with the following drawings in which like reference numerals designate like elements and wherein:

FIG. 1 is a longitudinal view, in partial section, of a "double-ended" hearing protector according to a preferred embodiment of the present invention;

FIG. 2 is a longitudinal section view of a "double-ended" hearing protector according to a second embodiment of the present invention;

FIG. 3 is a longitudinal section view of a "double-ended" hearing protector according to a third embodiment of the present invention;

FIGS. 4a-4c are longitudinal views, in partial section, of different configurations of the internal connector that join the two ends of the hearing protector according to the present invention;

FIG. 5 is a perspective view of an internal connector for the two ends of the hearing protector according to an embodiment of the present invention;

FIG. 6 is a longitudinal view, in partial section, of a hearing protector according to a fourth embodiment of the present invention.



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### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

FIG. 1 is a longitudinal view, in partial section, of the hearing protector according to one preferred embodiment of the present invention. The hearing protector includes a body 1 that is molded to fit in the auditory canal of the user. The body 1 is pierced by a channel 2 that runs from an end of the body 1 and terminates in the center of the body 1. The channel 2 contains an acoustic filter 3 that allows for example the selective and nonlinear filtration of sound. The other end of the body 1 is not perforated and allows maximum attenuation, regardless of the frequency and amplitude of the sound. Ideally, the body 1 has a length between 2 cm and 4 cm and is composed of a flexible material.

FIG. 2 is a longitudinal section view of the hearing protector according to a second embodiment of the present invention. The hearing protector includes a body 1 pierced by a channel 2 that terminates at each end of the body 1, as well as the center of body 1. The channel 2 also contains an acoustic filter 3 at each end. The filters may or may not be identical.

Referring to a third embodiment illustrated in FIG. 3, the hearing protector includes two cylindrical hollow ferrules 4 and 7 and an internal connector 8. The ferrules 4 and 7 are separate pieces that fit into one another and are joined by the internal connector 8 to keep the ferrules 4 and 7 together. Each ferrule 4 and 7 is provided with a substantially hemispherical face 6. The narrower portion of the face 6 is designed to be inserted first into the auditory canal. The substantially hemispherical face 6 ensures tightness between the hearing protector and the auditory canal. As illustrated in FIG. 3, at least one of the two ferrules, in this case, ferrule 4, is pierced by a channel 5 at its center. One of the two ends of the internal connector 8 that contains an acoustic filter 3 is inserted into at least one of the two ferrules 4 and 7. The acoustic filter 3 permits the selective non-linear filtration of sounds. The second ferrule, in this case, ferrule 7, need not be perforated and will allow maximum attenuation regardless of the frequency and amplitude of the sound. The internal connector 8 is pierced by a second channel 9 that connects at a first end with the first channel 5, which contains an acoustic filter 3, allowing for the use of the acoustic filter 3, and at a second end with the center of the connector 8. The second channel 9 is formed at a right angle to the channel 5.

Alternatively, in another embodiment, the internal connector 8 may also have a channel that extends in three locations, the center of the internal connector 8, as well as at each end of the internal connector 8. The portion of the channel that terminates at each end contains an acoustic filter 3 that may or may not be identical.

As shown in FIG. 4a, the internal connector 8 may include a single cylinder consisting of three cylindrical parts 10, 11, and 12. The central part 12 is pierced by a channel 9 at its center and has a diameter that is slightly larger than that of the other two parts 10 and 11. The two parts 10 and 11 have a diameter that is essentially equal to, but slightly larger than that of channel 5 in order to hold the assembly together. At least one of the two parts 10 and 11 is formed with channel 5, which contains an acoustic filter 3 and communicates with channel 9 in the central part 12, as shown in FIG. 5.

The internal connector 8 may have serrations, or ridges, as shown in FIGS. 4b and 6, or the internal connector 8 may have tapered ends 13 and 14, as shown in FIGS. 4c and 5. In the case when the internal connector 8 is in three parts, the

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two parts 10 and 11 will have the serrations, ridges, or tapered ends 13 and 14.

One of the two ferrules has a perforation that, when joined to connector 8, is aligned with that of the central end of channel 9 located in part 12.

FIG. 6 is a longitudinal view, in partial section, of the hearing protector according to a fourth embodiment of the present invention. The hearing protector is provided with flexible annular fins 15 on the ferrules 4 and 7 to wedge the hearing protector against the walls of the auditory canal. The fins 15 may have a diameter that increases from the inside to the outside of the auditory canal.

The hearing protector, according to the present invention, is especially useful for individuals who are exposed to very loud engine and weapon noises, such as the crews of airplanes or military vehicles on exercises, for example. The hearing protector, according to the present invention, can also be used effectively by other personnel exposed to high-intensity noises in their working environments, such as construction sites and quarries for example.

While this invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art. Accordingly, the preferred embodiments of the invention as set forth herein are intended to be illustrative, not limiting. Various changes may be made without departing from the spirit and scope of the invention as defined in the following claims.

What is claimed is:

1. A hearing protector for selectively or automatically reducing noises having intensities up to 190 dB, the hearing protector being intended to be sealingly inserted into an auditory canal of a user, the hearing protector comprising:
  - a cylindrical body having a center, a first end and a second end;
  - a channel extending from said first and second ends to said center of said cylindrical body; and
  - said channel containing a first acoustic filter and a second acoustic filter, each of said first and second filters being in communication with one of said first and second ends.
2. The hearing protector according to claim 1, wherein said first and second acoustic filters are identical.
3. The hearing protector according to claim 1, wherein said first and second acoustic filters are not identical.
4. The hearing protector according to claim 1, further having a ferrule at each of said first and second ends wherein said ferrules are separate and said cylindrical body forms an internal connector linking said ferrules.
5. The hearing protector according to claim 4, wherein said internal connector is a single cylinder, said channel forming a right angle and having a first end of said channel containing said first acoustic filter and terminating at at least one of said ferrules and a second end of said channel terminating in said center of said internal connector.
6. The hearing protector according to claim 4, wherein said channel in said internal connector terminates at said center of said internal connector and at said first end and said second end of said internal connector, said first end containing said first acoustic filter and said second end containing said second acoustic filter.
7. The hearing protector according to claim 6, wherein said first acoustic filter is identical to said second acoustic filter.
8. The hearing protector according to claim 6, wherein said first acoustic filter is not identical to said second acoustic filter.



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9. The hearing protector according to claim 4, wherein said internal connector includes a central cylindrical part having a central diameter, a first cylindrical part having a first diameter and a second cylindrical part having a second diameter, said central diameter being larger than said first diameter and said second diameter, said first diameter and said second diameter being larger than said channel, said first cylindrical part containing said first acoustic filter and said second cylindrical part contains said second acoustic filter.

10. The hearing protector according to claim 9, wherein said first acoustic filter and said second acoustic filter are identical.

11. The hearing protector according to claim 9, wherein said first acoustic filter and said second acoustic filter are not identical.

12. The hearing protector according to claim 4, wherein said internal connector has serrations for securing said ferrules to said internal connector.

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13. The hearing protector according to claim 4, wherein said internal connector has ridges for securing said ferrules to said internal connector.

14. The hearing protector according to claim 4, wherein said internal connector has tapered ends.

15. The hearing protector according to claim 1, wherein said ferrules each have an essentially hemispherical face having a narrow side, said narrow sides being designed to be inserted into the auditory canal of the user first.

16. The hearing protector of claim 1, wherein said cylindrical body is provided with annular fins, said fins having a diameter that increases from said first and second ends of said cylindrical body toward said center of said cylindrical body, the hearing protector being wedgingly securable within the auditory canal of the user.

17. The hearing protector according to claim 1, wherein said acoustic filters permit non-linear filtration of sound.

\* \* \* \* \*

# M1 Premium M2 Multi-Position M3 Cap-Mounted Earmuffs



## GOOD LOOKS AND STYLE

Exclusive iridescent color and sleek, curvy shape for a look that workers will want to wear. The SoftCoat® covering on the cups helps to muffle transmitted noise.

## UNIQUE METAL BAND DESIGN

The M1 Premium Earmuff features a black-chrome, spring steel headband that resists fatigue and is more durable. It maintains stability and doesn't twist out of shape like other wire-band earmuffs. Six different adjustment points provide a custom and comfortable fit for most head sizes. M1 folds into a super-compact size for easy storage.

## QUICK AND EASY ALIGNMENT

The special molded grips of the M2 Multi-Position Earmuff make fitting and alignment quick and easy. The cup adjustment is infinitely variable, distributing pressure evenly for a comfortable fit. The headband is made of lightweight plastic. The M3 Cap-Mounted version slots easily into any hard hat. Can be locked in the standby position for storage.

## MOLDEX TECHNICAL ASSISTANCE

Moldex provides all of the technical assistance required to set up a hearing protection program. For more information call +1 (800) 421-0668 ext. 512/550 or E-mail: [sales@moldex.com](mailto:sales@moldex.com) or visit [www.moldex.com](http://www.moldex.com).

## FEATURES

- 100% PVC-Free.
- SoftCoat® covering helps muffle transmitted noise.
- Exclusive iridescent color and curvy shape for great looks.
- High NRR ratings.
- Choose either M1 with metal band or M2/M3 with a lightweight plastic band.
- M1 Premium Earmuff folds for easy storage.
- M1 has a black-chrome, spring-steel band that doesn't twist out of shape like wire bands.
- M2/M3 have molded grips for easy and quick fitting.
- Independently tested to ANSI S3.19-1974.



M1



M2



M3



**MOLDEX**  
Identical Wear Well



**ATTENUATION DATA  
M1 (OVER-THE-HEAD)**

Tested According to ANSI Specs S3.19-1974 Michael &amp; Assoc., State College, PA.

Frequency (Hz)	125	250	500	1000	2000	3150	4000	6300	8000		
Mean Attenuation (dB)	16.4	23.9	27.8	36.2	37.5	43.9	46.1	44.4	42.7	NRR 29	CSA AL
Standard Deviation (dB)	2.8	2.6	2.0	3.5	2.8	3.9	3.6	4.1	4.7		

**ATTENUATION DATA  
M2 (BEHIND-THE-HEAD)**

Tested According to ANSI Specs S3.19-1974 Michael &amp; Assoc., State College, PA.

Frequency (Hz)	125	250	500	1000	2000	3150	4000	6300	8000		
Mean Attenuation (dB)	15.3	21.6	25.2	33.1	36.1	41.4	41.3	43.5	40.9	NRR 24	CSA AL
Standard Deviation (dB)	2.4	2.4	2.2	2.4	3.2	3.8	3.4	3.4	4.3		

**ATTENUATION DATA  
M3 (CAP-MOUNT)**

Tested According to ANSI Specs S3.19-1974 Michael &amp; Assoc., State College, PA.

Frequency (Hz)	125	250	500	1000	2000	3150	4000	6300	8000		
Mean Attenuation (dB)	17.9	22.4	26.1	31.5	35.5	40.2	43.1	40.9	37.6	NRR 24	CSA AL
Standard Deviation (dB)	3.4	2.3	2.5	3.2	2.8	3.8	3.8	3.8	4.5		

**WARNING TO USER**

1. Use this laboratory-derived attenuation data for comparison purposes only. The amount of protection afforded in field use often is significantly lower depending on how the protectors are fitted and worn.
2. Failure to follow all instructions could result in hearing loss or injury.
3. Failure to obtain a proper fit will reduce effectiveness of hearing protectors and could result in hearing loss or injury.
4. Earmuffs must only be used as part of a hearing conservation program that complies with applicable local safety and health regulations.
5. Overprotection can be dangerous. The wearer must be able to hear warning signals.
6. Wearers with hearing loss should exercise extreme caution.
7. It is the employer's responsibility to ensure that the type of hearing protector and its NRR is appropriate for the user in their particular workplace.
8. Failure to follow these warnings could result in serious injury or death.

**ATTENUATION DATA  
M2 (OVER-THE-HEAD)**

Tested According to ANSI Specs S3.19-1974 Michael &amp; Assoc., State College, PA.

Frequency (Hz)	125	250	500	1000	2000	3150	4000	6300	8000		
Mean Attenuation (dB)	16.4	23.9	29.4	34.2	35.6	43.7	45.0	43.2	42.1	NRR 26	CSA AL
Standard Deviation (dB)	2.3	2.5	2.3	2.4	2.4	2.4	2.1	2.8	3.1		

**ATTENUATION DATA  
M2 (UNDER-THE-CHIN)**

Tested According to ANSI Specs S3.19-1974 Michael &amp; Assoc., State College, PA.

Frequency (Hz)	125	250	500	1000	2000	3150	4000	6300	8000		
Mean Attenuation (dB)	15.5	20.2	25.7	33.5	36.7	42.0	42.2	43.7	40.8	NRR 24	CSA AL
Standard Deviation (dB)	1.9	2.4	2.4	2.1	3.4	2.7	3.0	4.5	4.4		

**PACKAGING****6100 M1 Premium Earmuff**

10 per Case

**6200 M2 Multi-Position Earmuff**

20 per Case

**6300 M3 Cap-Mounted Earmuff**

10 per Case

**6105 Hygiene Kit**

1 Pair per Bag

20 Bags per Case

**LIMITED WARRANTY IMPORTANT  
NOTICE TO PURCHASER**

This limited warranty is made in lieu of the warranties of merchantability, fitness for particular purposes and all other warranties, express or implied. There are no other warranties which extend beyond the description on the face hereof. The physical standards and specifications of Moldex will be met by products sold. Exclusive Remedies: damages for the breach of this limited warranty are limited to the replacement of such quantity of Moldex products proved to be defectively manufactured. Except as provided above, Moldex shall not be liable or responsible for any loss, damages, or liability, direct, indirect, incidental, special or consequential, arising out of a sale, use or misuse, or the inability to use products by the user.

**DISTRIBUTED BY:****MOLDEX-METRIC, INC.**

10111 W. Jefferson Blvd., Culver City, CA 90232

Tel: +1 (800) 421-0668 or +1 (310) 837-6500 Fax: +1 (310) 837-9563

Email: sales@moldex.com www.moldex.com

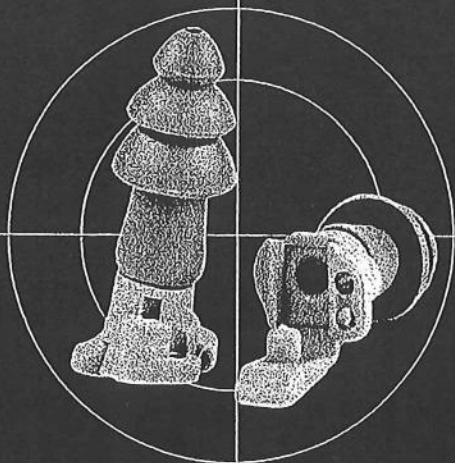
Moldex Technical Service Department: +1 (800) 421-0668 or +1 (310) 837-6500  
Ext. 512/550**CANADIAN CUSTOMER SERVICE**

TEL: +1 (310) 837-6500, Ext. 517 FAX: +1 (310) 837-9563

Moldex, Ideas that wear well and SoftCoat are registered trademarks.

U.S. Patents #D459,034, #D459,033, #D464,469, #D463,857 and #6,353,938  
9701-789 REV F 07/09
**MOLDEX**  
Ideas that wear well





# BATTLEPLUGS

Moldex BattlePlugs are now an authorized hearing protector for use by soldiers and Department of the Army civilians.



STATUS: UNCLASSIFIED

**MOLDEX**  
Ideas that wear well.



**BATTLEPLUGS**

STATUS: UNCLASSIFIED

**MOLDEX® BattlePlugs Impulse Earplugs**

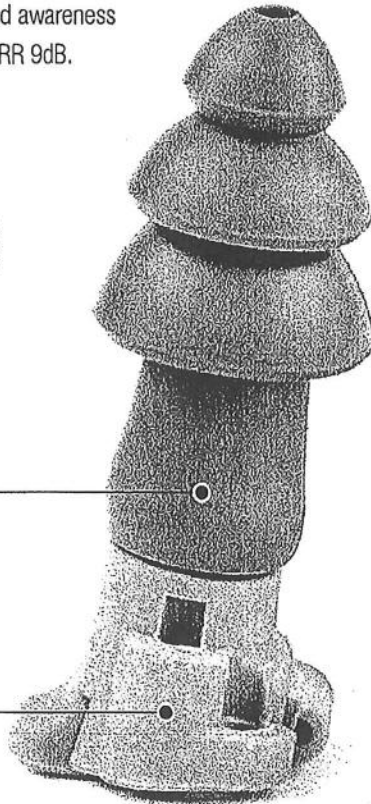
Patented Moldex BattlePlugs earplugs use a unique filter built into the plug body to instantaneously reduce dangerous, sudden impulse noises (e.g. weapons fire) plus allow for easy communication and improved awareness in the cap open position – NRR 9dB.



Closed Position

Unique patented  
plug design

Close cap for  
continuous/steady  
noise and impulse  
noise protection

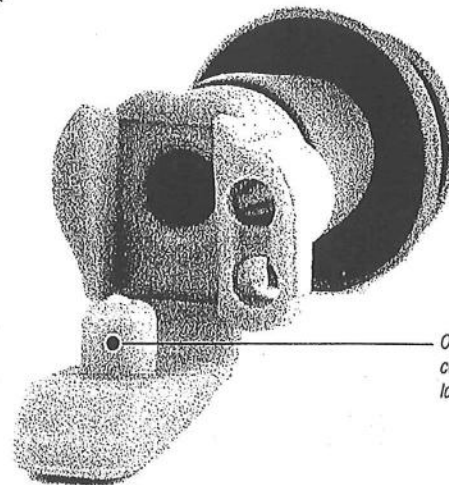


- Now an authorized hearing protector for use by soldiers and Department of the Army civilians.
- Dual Mode Protection.
  - Open cap to hear commands and for loud blasts.
  - Closed cap for continuous/steady noise and impulse noise protection.
- The louder the blast, the more noise reduction (in open position).
- Cap is easy to open and close, in-ear.
- Easy to see when cap is in open or closed mode.
- Easy to clean.

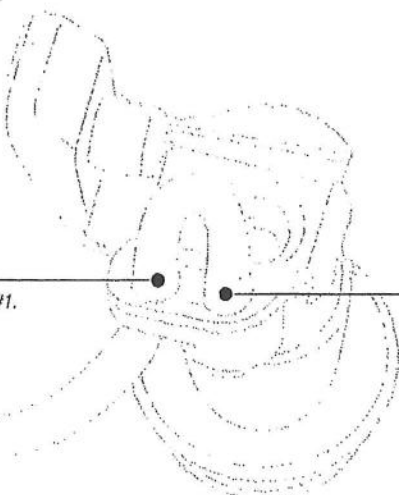


Open Position

Open cap to hear  
commands and for  
loud blasts

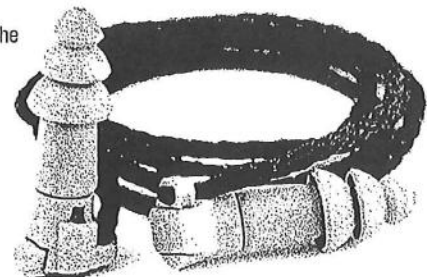
**BATTLEPLUGS Cording Instructions**

**Step 1**  
Thread cord  
through hole #1.

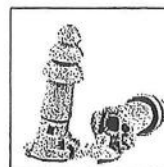


**Step 2**  
Insert tip of cord  
into hole #2 to lock  
cord in place.

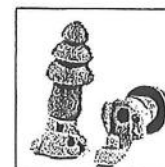
Ensure that cord does not interfere with the hinged cap fully closing. Failure to close the hinged cap completely may result in reduced noise attenuation.



Available in 3 sizes



Small



Medium



Large

## Fitting/Usage Instructions

### Important Information

When cap is open, this earplug can be used to reduce impulse noises, such as gunfire, while also allowing you to hear low level noise. In closed cap position it can be used to help protect against continuous and impulse noises. Training is required. Before first use, practice opening and closing cap while plug is NOT in the ear canal.

### Cautions

Improper fit and failure to wear at all times during exposure to loud noise, will reduce protection and result in hearing loss. Impulse noise will be louder with cap open than closed. Do not use with cap open during continuous high hazardous noise. Remove slowly by twisting to avoid damage to eardrum.

For use against continuous noise always wear with cap closed (Fig. 1)

- Before inserting plug check to see that cap is fully closed shut (Fig. 1).
- Reach over the head and pull top of ear upwards (Fig. 2).
- With other hand grasp plug handle and gently push and wiggle into ear canal until a good and comfortable seal is made.

For use against impulse noise when hearing other sounds/communication is also needed, wear with cap open (Fig. 3)

- If plug is already being worn with cap closed, you do not need to take plug out to open cap (Fig. 4).
- To open cap, depending on the orientation of the handle, use either your thumb or index finger to gently push out on the cap latch while resting the other on the hinge, (this may take practice) (Fig. 5).
- To insert plug with cap open, reach over the head and pull top of ear upwards (Fig. 6).
- With other hand grasp plug handle and gently push and wiggle into the ear canal until plug is resealed and comfortable.

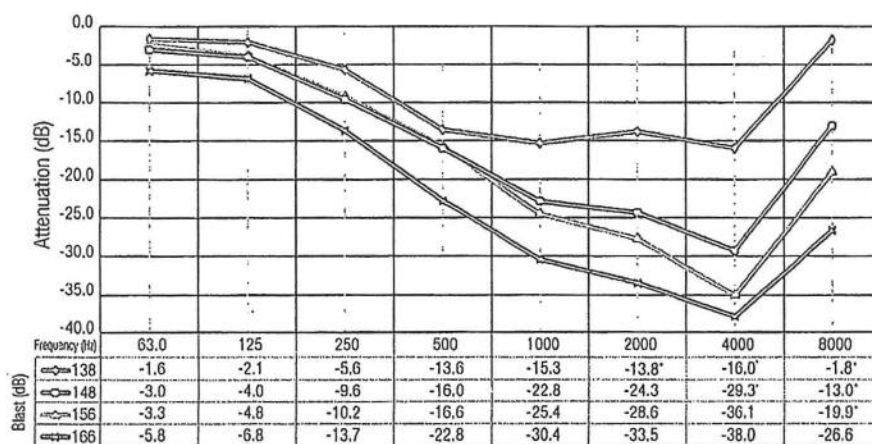
Closing cap with plug in ear.

- To close cap you do not need to take plug out.
- Depending on the orientation of the handle, use either your thumb or index finger to gently push the cap into the handle until it is fully shut, (this may take practice) (Fig. 7).

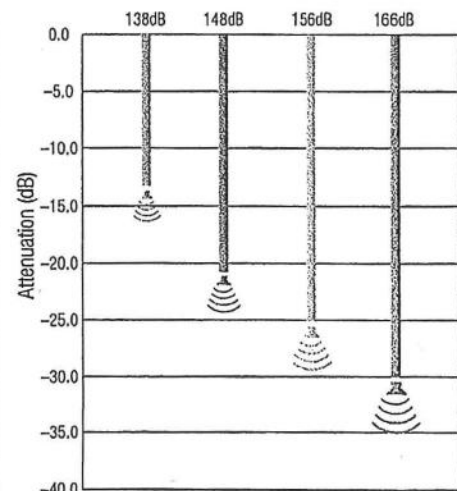
Easy to open and close in ear. Easy to see which mode is currently used.



Blast protection data (cap open position). The louder the blast, the more noise-reduction protection provided.



\*Values are compromised by low energy in impulse at these frequencies



Left chart tests are performed at specific frequencies. Right chart tests are performed across entire sound spectrum.



**BATTLEPLUGS**


STATUS: UNCLASSIFIED

## CAP CLOSED - PASSIVE NOISE LEVELS

## ATTENUATION DATA / DATOS DE ATENUACIÓN / DONNÉES D'ATTÉNUATION

Tested According to ANSI Spec S3.19-1974 Michael & Assoc., State College, PA.  
 Probado de acuerdo a las especificaciones ANSI S3.19-1974 Michael & Assoc., State College, PA.  
 Testé Conformes aux Spéc. ANSI S3.19-1974 Michael & Assoc., State College, PA.

Frequency (Hz) Frecuencia (Hz) Fréquence (Hz)	125	250	500	1000	2000	3150	4000	6300	8000		
Mean Attenuation (dB) Atenuación de Dato (dB) Atténuation Moyenne (dB)	31.3	27.0	34.2	30.7	35.1	40.9	34.1	31.1	32.3	NRR 24	CSA BL
Standard Deviation (dB) Desviación Standard (dB) Écart Standard (dB)	4.8	4.2	4.9	3.3	3.7	4.1	3.2	2.7	3.5		

Noise Reduction Rating	<b>24</b>	DECIBELS (WHEN USED AS DIRECTED)
THE RANGE OF NOISE REDUCTION RATINGS FOR EFFECTIVE HEARING PROTECTION IS APPROXIMATELY 8 TO 35. POUR UNE PROTECTION AUDITIVE PLUS EFFICACE, LES NIVEAUX DE PROTECTION SONT APPROXIMATIVEMENT DE 8 À 35.		
MOLDEX-METRIC, INC.	BattlePlugs	
Culver City, CA	+1(818) 418-6100 / +1(818) 418-6109	
Federal law prohibits removal of this label prior to purchase.	 LABEL REQUIRED BY US EPA REGULATION 19 CFR PART 311 SUBPART B	

## CAP OPEN - PASSIVE NOISE LEVELS

## ATTENUATION DATA / DATOS DE ATENUACIÓN / DONNÉES D'ATTÉNUATION

Tested According to ANSI Spec S3.19-1974 Michael & Assoc., State College, PA.  
 Probado de acuerdo a las especificaciones ANSI S3.19-1974 Michael & Assoc., State College, PA.  
 Testé Conformes aux Spéc. ANSI S3.19-1974 Michael & Assoc., State College, PA.

Frequency (Hz) Frecuencia (Hz) Fréquence (Hz)	125	250	500	1000	2000	3150	4000	6300	8000		
Mean Attenuation (dB) Atenuación de Dato (dB) Atténuation Moyenne (dB)	8.4	8.5	13.7	22.4	30.9	30.5	31.5	26.1	30.2	NRR 9	CSA C
Standard Deviation (dB) Desviación Standard (dB) Écart Standard (dB)	4.1	3.9	4.8	2.8	3.7	3.6	4.6	3.4	4.9		

Noise Reduction Rating	<b>9</b>	DECIBELS (WHEN USED AS DIRECTED)
THE RANGE OF NOISE REDUCTION RATINGS FOR EFFECTIVE HEARING PROTECTION IS APPROXIMATELY 8 TO 35. POUR UNE PROTECTION AUDITIVE PLUS EFFICACE, LES NIVEAUX DE PROTECTION SONT APPROXIMATIVEMENT DE 8 À 35.		
MOLDEX-METRIC, INC.	BattlePlugs	
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## CLEANING &amp; INSPECTION

Wash with soap and water only, and dry thoroughly before re-wearing. Keep filter hole in tip and handle free of earwax, dirt and dust. Confirm filter holes are clear by holding plug up to light source. If you cannot see light shining through filter holes rewash and check again. If unable to clear filter holes, replace earplugs. Inspect plugs for any tears or damage each time they are worn and replace immediately if necessary.

## WARNING TO USER

1. BattlePlugs reusable earplugs must be fitted and worn correctly to provide effective protection. Wash or clean hands before use. Plugs should be routinely washed with mild soap and warm water. CAUTION: Remove with a slow twisting motion to break the seal. Due to the tight seal, rapid removal may damage eardrum.
2. Use this laboratory-derived attenuation data for comparison purposes only. The amount of protection afforded in field use often is significantly lower depending on how the protectors are fitted and worn.
3. Failure to follow all instructions could result in hearing loss or injury. Failure to obtain a proper fit will reduce effectiveness of hearing protectors and could result in hearing loss or injury.
4. BattlePlugs must only be used as part of a hearing conservation program that complies with applicable local safety and health regulations.
5. Overprotection can be dangerous. The wearer must be able to hear warning signals.
6. Wearers with hearing loss should exercise extreme caution.
7. It is the employer's responsibility to ensure that the type of hearing protector and its NRR is appropriate for the user in their particular workplace.
8. Use caution when working around machinery or other equipment to ensure neck cord does not become caught or entangled.
9. Failure to follow these warnings could result in serious injury or death.
10. Although hearing protectors can be recommended for protection against the harmful effects of impulse noise, the Noise Reduction Rating (NRR) is based on the attenuation of continuous noise and may not be an accurate indicator of the protection attainable against impulse noise such as gunfire. (Wording required by EPA)

## DISTRIBUTED BY:

## ORDERING INFORMATION

SKU#	Plug Size	Qty./Case	Contents/Bag
6497	Small	50 Bags	Pair of BattlePlugs, cord, Pocket-Pak, Chain, and Instructions
6498	Medium	50 Bags	Pair of BattlePlugs, cord, Pocket-Pak, Chain, and Instructions
6499	Large	50 Bags	Pair of BattlePlugs, cord, Pocket-Pak, Chain, and Instructions

## Replacement Tips

6487T	50 Pairs of Small Replacement Tips in Zip-Top Bag
6488T	50 Pairs of Medium Replacement Tips in Zip-Top Bag
6489T	50 Pairs of Large Replacement Tips in Zip-Top Bag

## LIMITED WARRANTY IMPORTANT NOTICE TO PURCHASER

This limited warranty is made in lieu of the warranties of merchantability, fitness for particular purposes and all other warranties, express or implied. There are no other warranties which extend beyond the description on the face hereof. The physical standards and specifications of Moldex will be met by products sold. Exclusive Remedies: damages for the breach of this limited warranty are limited to the replacement of such quantity of Moldex products proved to be defectively manufactured. Except as provided above, Moldex shall not be liable or responsible for any loss, damages, or liability, direct, indirect, incidental, special or consequential, arising out of a sale, use or misuse, or the inability to use products by the user.

Keep earplugs away from infants and small children as they may get caught in the windpipe and create a choking hazard.

**MOLDEX**  
Ideas that wear well.

MOLDEX-METRIC, INC.  
10111 W. Jefferson Blvd., Culver City, CA 90232  
Tel: +1 (800) 421-0668 or +1 (310) 837-6500  
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Moldex Technical Service Department:  
+1 (800) 421-0668 or +1 (310) 837-6500 Ext. 512/550

Moldex, Ideas that wear well and the PVC-Free logo are registered trademarks. BattlePlugs is a trademark of Moldex-Metric, Inc. Made in U.S.A. Design Patent #D618333, other patent pending.

9900-035 REV D 11/11





RECEIPT#	AMOUNT	APPLYING IFP <input checked="" type="checkbox"/>	JUDGE	MAG. JUDGE
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## INSTRUCTIONS FOR ATTORNEYS COMPLETING CIVIL COVER SHEET FORM JS 44

## Authority For Civil Cover Sheet

The JS 44 civil cover sheet and the information contained herein neither replaces nor supplements the filings and service of pleading or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. Consequently, a civil cover sheet is submitted to the Clerk of Court for each civil complaint filed. The attorney filing a case should complete the form as follows:

**I. (a) Plaintiffs-Defendants.** Enter names (last, first, middle initial) of plaintiff and defendant. If the plaintiff or defendant is a government agency, use only the full name or standard abbreviations. If the plaintiff or defendant is an official within a government agency, identify first the agency and then the official, giving both name and title.

**(b) County of Residence.** For each civil case filed, except U.S. plaintiff cases, enter the name of the county where the first listed plaintiff resides at the time of filing. In U.S. plaintiff cases, enter the name of the county in which the first listed defendant resides at the time of filing. (NOTE: In land condemnation cases, the county of residence of the "defendant" is the location of the tract of land involved.)

**(c) Attorneys.** Enter the firm name, address, telephone number, and attorney of record. If there are several attorneys, list them on an attachment, noting in this section "(see attachment)".

**II. Jurisdiction.** The basis of jurisdiction is set forth under Rule 8(a), F.R.C.P., which requires that jurisdictions be shown in pleadings. Place an "X" in one of the boxes. If there is more than one basis of jurisdiction, precedence is given in the order shown below.

United States plaintiff. (1) Jurisdiction based on 28 U.S.C. 1345 and 1348. Suits by agencies and officers of the United States are included here.

United States defendant. (2) When the plaintiff is suing the United States, its officers or agencies, place an "X" in this box.

Federal question. (3) This refers to suits under 28 U.S.C. 1331, where jurisdiction arises under the Constitution of the United States, an amendment to the Constitution, an act of Congress or a treaty of the United States. In cases where the U.S. is a party, the U.S. plaintiff or defendant code takes precedence, and box 1 or 2 should be marked.

Diversity of citizenship. (4) This refers to suits under 28 U.S.C. 1332, where parties are citizens of different states. When Box 4 is checked, the citizenship of the different parties must be checked. (See Section III below; federal question actions take precedence over diversity cases.)

**III. Residence (citizenship) of Principal Parties.** This section of the JS 44 is to be completed if diversity of citizenship was indicated above. Mark this section for each principal party.

**IV. Nature of Suit.** Place an "X" in the appropriate box. If the nature of suit cannot be determined, be sure the cause of action, in Section VI below, is sufficient to enable the deputy clerk or the statistical clerks in the Administrative Office to determine the nature of suit. If the cause fits more than one nature of suit, select the most definitive.

**V. Origin.** Place an "X" in one of the seven boxes.

Original Proceedings. (1) Cases which originate in the United States district courts.

Removed from State Court. (2) Proceedings initiated in state courts may be removed to the district courts under Title 28 U.S.C., Section 1441. When the petition for removal is granted, check this box.

Remanded from Appellate Court. (3) Check this box for cases remanded to the district court for further action. Use the date of remand as the filing date.

Reinstated or Reopened. (4) Check this box for cases reinstated or reopened in the district court. Use the reopening date as the filing date.

Transferred from Another District. (5) For cases transferred under Title 28 U.S.C. Section 1404(a). Do not use this for within district transfers or multidistrict litigation transfers.

Multidistrict Litigation. (6) Check this box when a multidistrict case is transferred into the district under authority of Title 28 U.S.C. Section 1407. When this box is checked, do not check (5) above.

Appeal to District Judge from Magistrate Judgment. (7) Check this box for an appeal from a magistrate judge's decision.

**VI. Cause of Action.** Report the civil statute directly related to the cause of action and give a brief description of the cause. Do not cite jurisdictional statutes unless diversity.

Example: U.S. Civil Statute: 47 USC 553

Brief Description: Unauthorized reception of cable service

**VII. Requested in Complaint.** Class Action. Place an "X" in this box if you are filing a class action under Rule 23, F.R.Cv.P.

Demand. In this space enter the dollar amount (in thousands of dollars) being demanded or indicate other demand such as a preliminary injunction.

Jury Demand. Check the appropriate box to indicate whether or not a jury is being demanded.

**VIII. Related Cases.** This section of the JS 44 is used to reference related pending cases if any. If there are related pending cases, insert the docket numbers and the corresponding judge names for such cases.

**Date and Attorney Signature.** Date and sign the civil cover sheet.